

1 (i) CLAIMS:

2 1. A protective helmet providing at least one illuminating LED
3 array, including a circuit driven by at least one battery for
4 powering amplifying means to drive the array, the circuit
5 comprising: a comparator, the battery providing an input voltage
6 and a reference voltage for the comparator, the comparator being
7 turned on when the input voltage exceeds the reference voltage,
8 a semiconductor device actuated by the comparator, and
9 functioning as a shunt to maintain the load voltage constant for
10 voltage/current variations as the battery is worn down, and
11 amplifiers connected to the battery, semiconductor device and
12 comparator for turning on the LED array.

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14 2. The helmet of Claim 1, in which the comparator is an
15 operational amplifier, the semiconductor device is a Zener diode,
16 and the amplifiers are transistors.

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18 3. The helmet of Claim 2, in which input voltage is supplied to
19 the comparator through a voltage divider.

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21 4. The helmet of Claim 2, in which batteries provide about 6600
22 milliamps @ 7.2 volts, and the LED array provides about 4000 MCD
23 @ about 20 milliamps for about 5 - 5 1/2 hours for about 93 LEDs
24 in the arrays.

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1 5. The helmet of Claim 2, in which the zener diode is operated
2 in the reverse conduction condition to reduce ripple voltage.
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4 6. The helmet of Claim 2, comprising an inner component of
5 resilient material, and central and outer components of a hard
6 material, the components being secured together, and at least one
7 LED array mounted in at least one of the central and outer
8 components.
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10 7. The helmet of Claim 6, in which the resilient material is
11 constructed as a foam.
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13 8. The helmet of Claim 6, in which the central and outer
14 components are integrally formed of plastic material, at least
15 one of the said components providing a centrally disposed
16 reinforcing grid, and one or more batteries being secured in the
17 reinforcing grid when the central and outer components are joined
18 together.
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20 9. The helmet of Claim 2, in which components of the circuit
21 are mounted on a circuit board secured by the helmets, and two
22 batteries are employed for respective input and reference
23 voltages, the batteries being isolated from each other by a
24 diode.
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1 10. The helmet of Claim 1, the batteries being removable,
2 rechargeable, or both.

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4 11. A method for providing a helmet with at least one
5 illuminating LED array, which comprises incorporating a circuit
6 into the helmet, the circuit including: at least one battery for
7 powering amplifying means to drive the array, the circuit
8 comprising: a comparator, the battery providing an input voltage
9 and a reference voltage for the comparator, the comparator being
10 turned on when the input voltage exceeds the reference voltage,
11 a semiconductor device actuated by the comparator, and
12 functioning as a shunt to maintain the load voltage constant for
13 voltage/current variations as the battery is worn down, and
14 amplifiers connected to the battery, semiconductor device and
15 comparator for turning on the LED array.

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17 12. The method of claim 11, in which the comparator is an
18 operational amplifier; the semiconductor device is a Zener diode,
19 and the amplifiers are transistors.

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21 13. The helmet of Claim 12, in which input voltage is supplied
22 to the comparator through a voltage divider.

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1 14. The helmet of Claim 12, in which batteries provide about
2 6600 milliamps @ 7.2 volts, and the LED array provides about 4000
3 MCD @ about 20 milliamps for about 5 - 5 1/2 hours for about 93
4 LEDs in the arrays.

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6 15. The method of Claim 12, in which the Zener diode is operated
7 in the reverse conduction condition to reduce ripple voltage.

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9 16. The method of Claim 12, comprising an inner component of
10 resilient material, and central and outer components of a hard
11 material, the components being secured together, and an LED array
12 is mounted in at least one of the central and outer components.

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14 17. The method of Claim 16, in which the resilient material is
15 constructed as a foam.

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17 18. The method of Claim 16, in which the central and outer
18 components are integrally formed of plastic material and provide
19 at least one centrally disposed reinforcing grid, and batteries
20 being secured in the reinforcing grid when the central and outer
21 components are joined together.

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1 19. The method of Claim 12, in which components of the circuit
2 are mounted on a circuit board secured by the helmets, and two
3 batteries are separately employed for respective input and
4 reference voltages.

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6 20. The method of Claim 11, in which the batteries are operated
7 as being removable and rechargeable.

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